

Original Article

Success rate of elective lumbar puncture at a major Melbourne neurology unit

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Received: 13 November 17 Accepted: 21 November 17 Published: 16 January 18

Abstract

Background: Lumbar puncture remains an important diagnostic and therapeutic procedure in clinical neurology. Failed lumbar punctures can result in a delay in diagnosis. Ultrasound may have a role in increasing successful lumbar puncture rates.

Methods: Data was collected retrospectively from patient notes who had an elective lumbar puncture from January 2012 to August 2015.

Results: During this four-year period, 74 patients underwent a neurologic outpatient lumbar puncture. Of these 74 lumbar punctures, 53 were successful (28% failure rate).

Conclusions: This study found a 28% failure rate of conventional palpation-guided lumbar puncture. Ultrasound may provide an exciting opportunity to optimize lumbar puncture procedures and improve patient experience and diagnostic outcomes.

Key Words: Lumbar puncture, spinal puncture, ultrasonography

Access this article online

Website:

www.surgicalneurologyint.com

DOI:

10.4103/sni.sni_426_17

Quick Response Code:

INTRODUCTION

Lumbar puncture remains an important diagnostic and therapeutic procedure in clinical neurology. Failed lumbar punctures can result in a delay in diagnosis. This delay can be costly to not just the patient but also the hospital as repeat attempts may be needed by specialist services including radiology or anesthesia. Traumatic taps can also make interpretation difficult.

Previous research has shown that the rate of successful palpation-based lumbar puncture is below 100%.^[1] Ultrasound-assisted lumbar puncture may help increase the success rates of lumbar puncture in acute clinical setting.^[6]

MATERIALS AND METHODS

Study design and data collection

All patient data was collected retrospectively from the notes of elective lumbar puncture patients at Western

Health, Footscray, Victoria, Australia. Western Health is affiliated with the University of Melbourne and Notre Dame University. This is a retrospective cohort study. Ethical approval was granted by the Western Health Low Risk Ethics Panel (QA2016.62). Data was collected retrospectively from patient notes from January 2012 to August 2015 and included the date of the admission, whether the lumbar puncture was successful, the number of attempts made on the day, and whether the procedure

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How to cite this article: Williams P, Tait G, Wijeratne T. Success rate of elective lumbar puncture at a major Melbourne neurology unit. *Surg Neurol Int* 2018;9:12. <http://surgicalneurologyint.com/Success-rate-of-elective-lumbar-puncture-at-a-major-Melbourne-neurology-unit/>

was documented as being traumatic. If the assistance of a subsequent department was needed, the name of the department, whether the lumbar puncture was successful, and the number of attempts were recorded. There were no exclusion criteria.

Outcome measures

We hypothesized that the success rate of lumbar puncture performed by the Neurology Department residents would be below 100%.

Statistical analysis

Statistical software (StataCorp. 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP) was used to analyze the data.

RESULTS

During this four-year period, 74 patients underwent neurologic outpatient lumbar puncture. Of these 74 lumbar punctures, 53 were successful (28% failure rate). The remaining 21 patients were subsequently referred to another department for lumbar puncture. The referral department was almost exclusively radiology with 19 patient referrals. Three patients were referred to anesthetics.

DISCUSSION

This study found a 28% failure rate of conventional palpation-guided lumbar puncture. The placement for bedside lumbar puncture is determined by clinician's palpation of Tuffier's line, which connects the peaks of the iliac crests and may indicate the site of the L4/L5 interspinous space.^[5] The accuracy of this method for L4/5 identification has been found to be low in multiple studies.^[5] Accuracy of palpation and ease of lumbar puncture placement can be further complicated by patient factors such as female gender, obesity, prior spinal surgery, and increasing age.^[2,4]

Fluoroscopy-guided lumbar puncture is the common rescue modality currently used when difficulty is encountered. Fluoroscopy is expensive, exposes the patient to radiation, and requires considerable expertise.^[6] Although ultrasound has limitations, in comparison, it is portable, has low cost, uses no radiation, and is simple to use.

In health economic terms, efforts to reduce the failure rate of lumbar punctures may be warranted. Prior ultrasound research has shown that a lumbar puncture costs approximately \$USD 192.^[3] The use

of a traumatic needle increases the baseline cost of the kit but reduces overall expense via reduced readmissions and complications from postdural puncture headache (PDPH). The authors suggested that, if applied to only neurology-performed lumbar punctures in the US, \$USD 10.4 million could be saved each year. In a similar manner, the addition of ultrasound to a lumbar puncture protocol has the potential to lower overall costs by reducing the number of subsequent readmissions.

Ultrasound may provide an exciting opportunity to optimize lumbar puncture procedures and improve patient experience and diagnostic outcomes. Further research is required before ultrasound is introduced as a standard aid to lumbar puncture.

CONCLUSION

53 of the 74 lumbar punctures were successful in a retrospective audit of patient notes from January 2012 to August 2015. The use of ultrasound has the potential to improve initial success rates and may ultimately reduce cost and improve patient care.

Acknowledgements

The authors wish to thank the Department of Neurology at Western Health. The authors would also like to thank the nurses in the Medical Admissions Day Unit and Christopher Barrington-Brown of the Performance Unit for his help in collecting the data.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Baxter AL, Fisher RG, Burke BL, Goldblatt SS, Isaacman DJ, Lawson ML. Local Anesthetic and Stylet Styles: Factors Associated With Resident Lumbar Puncture Success. *Pediatrics* 2006;117:876-81.
2. Christie E, Tung, Yuen T, So, Maarten G, Lansberg. Cost comparison between the atraumatic and cutting lumbar puncture needles. *Neurology* 2012;78:109-13.
3. Chakraverty R, Oynsent P, Isaacs K. Which spinal levels are identified by palpation of the iliac crests and the posterior superior iliac spines?. *J Anat* 2007;210:232-6.
4. Honarbakhsh S, Osman C, Teo J, Gabriel C. Ultrasound-guided lumbar puncture as a diagnostic aid to reduce number of attempts and complication rates. *Ultrasound* 2013;21:170-5.
5. Schlotterbeck H, Schaeffer R, Dow W, Touert Y, Bailey S, Diemunsch P. Ultrasonographic control of the puncture level for lumbar neuraxial block in obstetric anaesthesia. *BJA* 2008;100:230-4.
6. Shaikh F, Brezinski J, Alexander S, Arzola C, Carvalho J, Beyene J, et al. Ultrasound imaging for lumbar punctures and epidural catheterisations: Systematic review and meta-analysis. *BMJ* 2013;346.